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SCIENCE

FRIDAY, MAY 16, 1913

ON THE CULTIVATION OF THE CLINICAL
SCIENCES OF DIAGNOSIS AND
THERAPY¹

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IN preparing this address some weeks ago, I had written the statement that the membership of this association had fortunately been spared by death from any diminution in its numbers during the past year; shortly before this meeting, however, the association has suffered the loss of two of its original members—Dr. John S. Billings and Dr. Francis P. Kinnicutt, and one of its associate members, Dr. Hugh A. Stewart.

We now enter upon the work of the twenty-eighth annual meeting. Each annual session begins with an address from the president, by by-law limited to half an hour, and by custom including, first, an expression of appreciation of the honor of presiding over the assembly, and, second, suggestions for the promotion of the welfare of the association and, more especially, for the adaptation of its functions to the ever-changing conditions of American medicine.

My first duty is, then, to give thanks. The president of the association would indeed be guilty of ingratitude were he to omit to thank his colleagues for the honor and distinction they confer upon him by his election. Even though the choice comes automatically in serial sequence to members of the council, to be chosen as this officer is an honor which an ambitious physician might well be willing to look forward to as a possible culminating event

¹ Address of the president before the Association of American Physicians, Washington, May 6, 1913.

in a life of distinguished service in the profession. In the present instance, the selection has obviously been made rather as an encouragement to future work than as a reward for past performance; I can only be grateful for the generosity shown me and for the powerful stimulus to worthy effort which such confidence begets.

Turning now to the work of the association itself, it is plain that the great changes which have taken place in medicine since the foundation of the society in 1886 have modified old needs as regards associations and created new ones. Our attention has been called repeatedly to the changing needs by our presiding officers, most emphatically, perhaps, by Dr. Councilman in 1904 and by Dr. Adami last year.

Methods of medical education in the United States have passed through a veritable revolution. The proprietary medical schools, useful enough in their time, became insufficient and have been largely replaced by medical departments of universities, privately endowed, or aided by the states. The laboratory disciplines, under the stimulus of the great advances of biology, chemistry and physics in the second half of the last century, have experienced an unprecedented expansion, and the army of medical teachers and investigators has thus been recruited by a series of new battalions, made up of men trained in pathology, bacteriology, physiology, psychology, physiological chemistry, pharmacology, anatomy, histology and embryology. Many of the teachers and investigators in these purely laboratory branches are men limited in clinical experience to their undergraduate training; some of them, indeed, have entered upon a career in these fundamental medical sciences, after a preliminary apprenticeship in laboratories of biology or chemistry without taking even an undergraduate

course in medicine. Meantime a high degree of specialization has been taking place also in the clinical branches. With the advent of anesthesia and asepsis in surgery came the opportunity for unexpected divisions of labor in surgical fields, while the introduction of instruments of precision, and of the methods of pathology and bacteriology, of biology and chemistry, in the work of internal medicine led to the intensive development, by skilled workers, of its various special domains.

One result of the almost explosive progress in the purely laboratory branches, has been to place the clinical subjects, and especially internal medicine, in almost an embarrassing situation. Internal medicine is, of all the biological sciences, the one to which the largest number of other sciences contribute facts for application. Internal medicine is usually designated as one of the "applied sciences." But all the sciences, with the possible exception of mathematics, are largely "applied science." Thus, physics consists in part of applications of mathematics; chemistry of applications of mathematics and physics; biology of mathematics, physics and chemistry; physiology of physics, chemistry and biology, and so on, with avalanche-like increase of the sciences to be applied, until internal medicine is reached with all the laboratory subjects offering it their aid.

Now each of these sciences, though largely applied science, is compelled to grow in its own way; each science is creative and has to devise methods of its own; even when a new fact in a science basal to it is applicable, the application has actually to be made. Take physiology as an example. A new discovery in physics, or in chemistry, does not enrich physiology until physiology makes use of it; indeed it may long lie unapplied since its fruitful application in physiology involves a physi-

ological research. The number of physical, chemical and biological facts as yet unapplied to physiological problems is so enormous, and the number and powers of physiological workers relatively so limited that progress, though rapid, in physiology, can by no means keep pace with that of its underlying sciences, no matter how desirable this may seem.

The clinical subjects are similarly situated though in transcendent degree. It is almost a wonder that the clinician is not suffocated by the physical, chemical, biological, anatomical, physiological, pharmacological, pathological, parasitological and psychological facts which are being heaped upon him with clamor for their application. Moreover, the facts have arrived so suddenly that they find the clinician, in many instances, unable to understand them, much less to apply them. Certain chemical, physiological and anatomical facts the clinician of the last generation had, indeed, trained himself to apply by study in the post-mortem room, in the histological laboratory and in the laboratory for urinalysis. But recently, and all at once, the air has become thick with applicable facts of the most diverse origin, and only the younger clinicians have had opportunity for securing a training permitting of an understanding of even a part of them.

For some years past, students have been entering the clinics for instruction after three or four years of education in the methods and facts of the basal sciences from physics to pathology. They have been surprised to find, in many instances, their clinical teachers relatively unacquainted with the present-day content of the laboratory disciplines, and have often been astonished at the delay in attempting to apply in clinical studies facts of those laboratory branches which seem to them

obviously applicable to the work of diagnosis and therapy. Such personal observations by students working in the clinics have been a sharp spur to clinical men, and have undoubtedly gone far toward accelerating the application of laboratory facts and methods in the study and treatment of the sick. At times, of course, criticisms have been too severe or unjust. Students are prone to be harsh critics; their "young hot blood tingles to be up and doing"; often they know little of the circumstances which delay progress. In certain regrettable instances students may even have been led by a zealous but ill-informed pre-clinical teacher to believe that the workers in the clinical branches are not to be regarded as "scientific," but rather as "merely practical" men. This is an attitude occasionally assumed—happily less often now than a few years ago—by representatives of various sciences to all sciences to which they contribute facts for application, that is, to all sciences except those which are basal to their own. I can recall the time when an occasional teacher of physics, or of chemistry, hinted that the representatives of physiology or of physiological chemistry were amateurish or unscientific because the work in these branches is subject to conditions often inconsonant with profitable measurement in dynes or with graphic representation of stereochemical conceptions. But the older may well profit from the criticism of the younger, even if it be arrogant or unjust. The veteran, when taken to task by the recruit, may be amused, but if wise, instead of being offended, he will listen and will try to rejuvenate himself. In any case, he will rejoice in the vigor and optimism of the youth, and a part of his reward will lie in the consciousness of helping to train a group of successors who will surpass him.

It has been interesting to observe the attempts which have recently been made more fully and rapidly to utilize the new knowledge in the underlying sciences for the furthering of the work of diagnosis and therapy in the clinics. On the one hand, the older clinicians have heroically endeavored to acquaint themselves with the new facts as they have appeared; and they have hastened to surround themselves in their wards and in the clinical laboratories with younger men, trained in the newer laboratory methods, men who could aid them in the work of clinically applying the new facts. And, on the other hand, several universities have recently appointed to important clinical positions men who have been trained predominantly in the laboratory branches and who have made their early reputation in pathology, physiology, anatomy or chemistry, rather than in the clinical sciences. In these instances, we see two methods used to overcome a great difficulty and both are laudable. Each of them has led to advances in clinical teaching and research, but each of them is subject to obvious disadvantages. In the one instance, the clinical problems may be in the foreground, but insufficient personal acquaintance with the newer fundamental facts to be utilized limits vision; moreover, the lack of machinery for the utilization of the newer knowledge hampers the organization of diagnostic and therapeutic investigation. In the other instance, there is a real danger of an underappreciation of the nature, significance and scientific importance of the problems of diagnosis and therapeutics as such; the clinical appointee especially when untrained, or only slightly trained, in clinical work, and previously nursed in a fosterage, perhaps unfamiliar with, or even mildly disparaging of, the work of the clinic and of clinicians, may feel actually

ashamed to work at the bedside and in the laboratory at truly clinical problems, feeling that his former colleagues, to whom he may owe his appointment, will regard him as a scientific clinician only when he avoids researches bearing directly upon diagnosis and therapy and devotes his energies to the solution of non-clinical problems, the attack on which properly belongs to the laboratories of pathology, physiology or chemistry.

The situation is gradually righting itself. The non-clinical scientists realize better than they did what clinical work is and should be, and that workers in clinical branches should not be expected to leave their own fields to conduct other researches any more than the clinician can expect the anatomists or the physiological chemists to solve either the diagnostic and therapeutic problems of the clinic or the fundamental problems of physics and mathematics. All are acknowledging that the problems of diagnosis and therapy are tasks set by the patients themselves, that these living patients are, primarily, the objects of study of the clinical scientist. For this study a fine imaginative vision—properly schooled and rigidly controlled—is desirable. Patients must, in each generation, be looked at with fresh eyes, intellectualized partly by accurate training in the most recent clinical technique, partly by previous education in the methods, facts and hypotheses of the non-clinical sciences. It is gratifying that clinical men themselves, including those with extended training in one or more of the non-clinical sciences, are, more than ever before, recognizing the worth and dignity of diagnosis and therapy as sciences *per se*—that is to say, as bodies of knowledge to be increased, not merely as arts to be practised—sciences to be cultivated for their own sake as intensively, as proudly, and as enthusi-

astically as are the more basal sciences. And this is why clinical men are seeing to it that provision is made in the clinics themselves, not for the presence of patients only, but also for elaborate machinery for investigating them; they are demanding and equipping *in each clinic* a number of laboratories in which physical, chemical, physiological, pharmacological, bacteriological, psychological and other methods and facts can be directly applied by trained men in the diagnostic and therapeutic inquiries to which the conditions existing in the patients actually before them lead.¹ And, in addition to the more permanent staff, they are taking with them to the bedside and to the adjacent experimental laboratories of the clinic groups of medical students, trained in the basal medical sciences and making them responsible for the large amounts of routine work of which these students are capable while they are acquiring their early clinical experiences. To obtain proper facilities for clinical study and especially the multiple laboratories manned by skilled workers necessary in each clinic, not only will much money be required, but also an awakening of the understanding of the clinical men themselves, of non-clinical medical scientists and of hospital superintendents and trustees to the need. By many it is still thought that the laboratories of the non-clinical sciences can be called upon to do the laboratory work of the clinical sciences. By others, and especially by the superintendents of general hospitals (who are forced rigidly to limit the expenditure of money), the fallacy is still cherished that a "general clinical laboratory" in the hospital can best do the work of all the clinics for them. This, it seems to me, is a grave error. I am convinced that nothing short

¹ Cf. "The Organization of the Laboratories in the Medical Clinic," *Johns Hopkins Hospital Bull.*, 1909, XVIII., 193-198.

of multiple special laboratory divisions *for the direction of which each clinic is itself actually responsible*, will ever satisfactorily supply the needs. Any other arrangement will emasculate the individual clinics and paralyze research in diagnosis and therapy. It was for a precisely similar independence for physiology that Purkinje had his great struggle about the beginning of the last century. The university faculty, and the university Kurator put great obstacles in the way. They did not see why physiology should not use the other laboratory (anatomy) for the work. The Kurator sarcastically asked "where will it lead to, if every scientific branch demands its own laboratory?" Thanks to Purkinje's clear vision and his persistence, and through the influence of Goethe and Alex. v. Humboldt, physiology finally got its independent institute. Von Ziemssen recognized a similar need for the medical clinics and demanded a "clinical institute" for teaching and laboratory researches in addition to his hospital wards. Only after such salutary conditions as those referred to have been realized in the clinics, and have been maintained there for a time, can we hope to breed a generation of clinicians in any way approaching the next necessary and realizable type—a type resulting from the fusion of training in accurate clinical observation with training in the solution of clinical problems by experimental work in the laboratory. The goal stands clearly in the view of those of us who are familiar with the present conditions and are ambitious for the advance of clinical knowledge. That this goal is being rapidly approached should be a consolation to the generation of clinicians chafing under the limitations of the period through which we are passing, more than one member of which has felt keenly the truth of the adage that "the

man who rings the bell can not march in the procession."

The state of affairs to which I have referred has, to a certain extent, been reflected in the membership, and in the programs of the meetings, of this association. In 1886, the membership was made up chiefly of clinicians with a sprinkling of laboratory workers. In 1899, of 118 members, some 18 were pure laboratory workers who saw no patients at all. At present of 131 members, some 32 are pure laboratory workers who do not see patients, and many more are largely engaged in experimental work. Of the associate members, from whom our new members are in the near future to be drawn, at least one third are men who do not study patients but are engaged entirely in laboratory teaching or research.

A glance over the program of the meeting of 1899 shows that three non-clinical and twenty-seven clinical papers were presented. Last year, the program listed some thirteen non-clinical and some forty-six clinical papers. Our program this year includes some fourteen non-clinical and some fifty-one clinical papers.² A large proportion of the papers classed as clinical are reports of combined bedside and laboratory work. Now, on the whole this must be regarded as a very gratifying showing, illustrating, as it does, the great expansion in our clinics of work by experimental methods, as contrasted with work by more purely observational and statistical methods.

None welcomes, nor confides in, the experimental method more, perhaps, than I, but the observational method also deserves ever new application in clinical work. Is it not conceivable that we may actually retard progress in diagnosis and

therapy if we center investigation in our clinics and in their laboratories upon problems far removed from the conditions observable in the sick? May it not be desirable to plan that the experimental work in the clinics shall, for the most part, bear directly upon the problems of diagnosis and therapy (of course, in a wide sense, including etiology, pathogenesis and prognosis), and to arrange that the more fundamental physiological and experimental pathological inquiries be relegated to those laboratories, the particular business of which is to advance the sciences of general physiology and general pathology. Unless clinical men jealously guard their time, their interest, their energies and their materials in order to devote them to the advance of the clinical sciences, the progress of diagnosis and therapy must be slowed. Not that a clinician may not become so interested in pathology, physiology or physics as to make it justifiable for him to leave the clinic and occupy a non-clinical post. The clinics can only be proud to send occasionally a Helmholtz to physiology, as chemistry may be glad to contribute an Ostwald to philosophy. A man must go where his cerebral cortex leads him, be it from physics to physics, as in Helmholtz's case, or from crystallography to therapy, as in Pasteur's. Moreover, even in truly clinical investigation there will often be non-clinical by-products of great scientific value to which there can be no objection provided the main product corresponds to the aims of the clinical sciences. But, at this time, it would seem important to emphasize that researches in general physiology and in general pathology, valuable and desirable as they are for the progress of the medical sciences, as a whole, pertain to a field other than that which the clinics themselves should predominantly cultivate. May I illustrate by an analogy? Were our physiol-

²In making this arbitrary division into clinical and non-clinical papers I am guided by the direct relationship of the topic to the diagnosis and treatment of disease in human beings.

ogists to devote their time chiefly to the inquiries now pursued in the university laboratories of physics and chemistry to the neglect of their own physiological studies, the science of physiology would undoubtedly suffer. Now, none the less will scientific clinical work suffer loss if the men who are presumably cultivating the clinical sciences of diagnosis and therapy overlook their own legitimate problems, neglecting their clinical material to dissipate their time, and their energies, in the general or special non-clinical inquiries which properly belong to the more fundamental laboratories. The Wassermann reaction may be primarily worked out in a non-clinical laboratory, but the determination of its real significance for the diagnosis and treatment of disease demands, subsequently, long years of clinical research. Salvarsan may be made, and its spirilloidal power tested, in experimental non-clinical laboratories, but its application and value in the treatment of the different forms of syphilis are problems upon which the clinics have only begun to work—problems the full solution of which may be slow in following upon the initial non-clinical investigations.

And this brings me again to our membership and the programs of our meetings. The mingling of clinicians (who study patients and who do experimental work in laboratories on clinical problems) with non-clinical experimental workers is stimulating, I believe, to both and *I trust that this association will always contain both*. Certainly, our non-clinical members have been and now are the very flower of our association. It must be remembered, however, that the anatomists, the physiologists, the biological chemists and the pathologists and bacteriologists now have their special societies, but that practitioners, teachers and investigators of internal medicine have

their principal representation in this association, and it has always been taken for granted that this association is mainly, though not exclusively, a society for workers in internal medicine (in the broad sense). In selecting new members, ought we not always to keep this main function of the association in mind?

Again, may we not do well to pay close attention to this main function in making up the programs for our annual meetings? There is a wide-spread and growing feeling among our members that the farther removed a paper is from the examination and treatment of patients, the more acceptable it is for the program. Able clinical men have told me that they find some of the papers presented at the meetings too far removed from the fields of diagnosis and therapy to be interesting or even intelligible to them. "Those who read these papers speak to us as in a foreign language" is a complaint I have more than once heard. Such a difficulty can not, of course, with a mixed membership, be wholly overcome. But something could, it seems to me, be done to remedy what careful consideration indicates is a real detriment to the fullest success of our meetings. Better suggestions than mine will, I hope, come from other members, but two possibilities occur to me. First, might we not, while accepting some papers in general physiology and general pathology, urge that they be of a character likely to enlist the interest of clinicians and that they be presented in a form easy to understand by men who have not worked upon the special subjects with which they deal; papers in general pathology and physiology of different content might better be presented in the societies of the physiologists and pathologists. Secondly, may it not be helpful to arrange the papers on the program in groups in some such way as that adopted

this year; an individual member could then attend particular sessions, or all sessions, according as his interest and activities are specialized, or more general. A glance at this year's program shows the broad scope of the combined interests of the members of this association; and this scope is sure to become still broader as internal medicine grows and specialization in its various subdivisions increases. Thus, before long, the problems of "social medicine" are likely to engage us more than they do now. And I should like, in closing, to refer for a moment to this topic. Society at present tries, for its own welfare, to educate all citizens of the state. It may soon decide to try also to maintain the health and efficiency of all. Should society so resolve, a great extension of the municipal, state and federal medical services would become necessary to prevent disease; and the present method of treating patients at their homes would, in all probability, be largely replaced by hospital treatment. And if health should come to mean more than mere existence without outspoken physical disease—to include an abundant vitality, the capacity for joyous activity and for successful adaptation to the environment—then society, to maintain the health of its members, would have to see to it that the children born inherit bodies capable of normal responses to environmental stimuli, and further, that the various environmental stimuli to which individuals are exposed are beneficial to them and not too injurious. Such an ideal campaign for health seems at present a mere dream. But some dreams are prophetic forerunners of reality, and if we are to judge of the future by certain signs in the present, say by the institution of the *Krankenasse* in Germany and by the movement toward a national medical service as advocated by Lloyd George in Eng-

land, it may not be long before we shall, in this country, too, be taking some important steps forward in "social medicine." And when the time for this is at hand, we can be sure that this Association of American Physicians will be ready to throw its influence in the direction most helpful to society as a whole.

LEWELLYS F. BARKER

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THE MEANING OF GRADUATE STUDY¹

It was a pleasure to me to accept the invitation tendered through your vice-president to appear before you to-night to speak on "The Meaning of Graduate Study." That it is important to every member of this club to have an adequate conception of this matter is obvious, and I shall not take time to emphasize this fact. I should like to say, however, by way of preliminary, that it is also vital to the university and to the state that both you and all the people of the state should be clear and accurate in your judgment as to the true nature and character of graduate work. On this depends, to a large extent, the success of the university and the measure of service which it may render to its constituency. I hope that the way in which your graduate study is thus vitally related to the university and to the community at large will appear with appropriate emphasis before I have done speaking.

We shall best avoid mutual misunderstanding if I state at the outset the answer which I have in mind to the question, "What is graduate study?"

In the first place it is not a further extension of undergraduate study. It is something different, not merely in degree, but rather in kind. The change from undergraduate to graduate work should be as marked as that from the high school to the university. On passing from the lower to the higher the student goes into a new atmosphere. He finds what is to him a novel attitude and point of

¹ Address to the Graduate Club of Indiana University, December 10, 1912.